Institute for Advanced Sustainability Studies (IASS)

Understanding Ozone Pollution:

A Comparison of Chemical Mechanisms

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Motivation

- Importance of O_3 production chemistry representation – future emission scenarios.
- Compare different O_3 chemistry representations used in chemical transport models.
- Determine effects on O_3 production by comparing treatment of Volatile Organic Compounds (VOCs) degradation products.

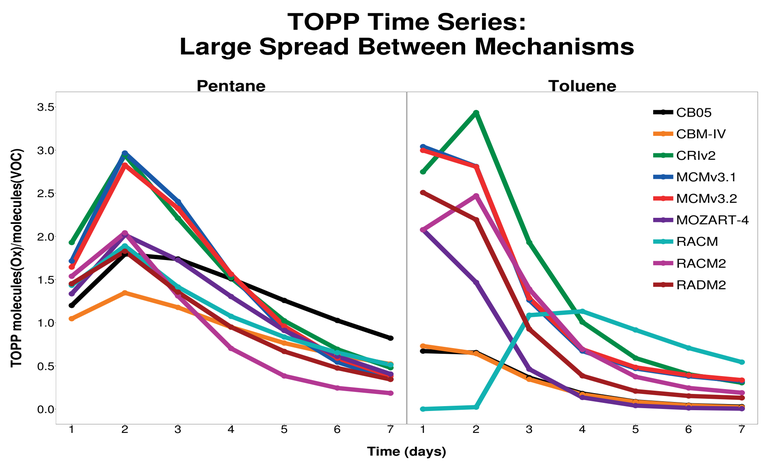
Approach

- Tagged Ozone Production Potentials (TOPPs) [1] calculated over 7 days for VOCs common to urban environments.
- Following mechanisms are compared to MCM v3.2.

MCM v3.1	CRI v2	CBM-IV	CB05
RADM2	RACM	RACM2	MOZART-4

- O_x (= $O_3 + NO_2$) production allocated to the emitted VOC by 'tagging' organic degradation products.

Results



Conclusions

- More explicit mechanisms have larger O_x production than less explicit mechanisms.
- VOCs break down into smaller fragments quicker in less-explicit mechanisms resulting in less O_3 production.
- The first day O_3 production similar between many mechanisms, larger differences over time.
- Differences in VOC degradation products can impact on O_3 production – RACM aromatic chemistry.

References

[1] T. M. Butler, M. G. Lawrence, D. Taraborrelli, and J. Lelieveld. Multi-day ozone production potential of volatile organic compounds calculated with a tagging approach. Atmospheric Environment, 45(24):4082–4090, 2011.

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